**Misinformation in COVID-19: a living map of research evidence**

**Overview**

This living map ('the map') is being maintained by the [EPPI Centre](https://eppi.ioe.ac.uk/cms/) as part of our role in the [ESRC International Public Policy Observatory (IPPO)](http://covidandsociety.com/) on COVID-19.

The map is published as an [open-access web database](https://eppi.ioe.ac.uk/eppi-vis/login/open?webdbid=232) containing bibliographic records of research articles about misinformation in COVID-19, organised by (sub-)topic(s), version(s), research type, and misinformation term(s).

The map can also be explored as a pre-configured evidence (and gap) map (see the ‘Evidence and Gap Maps’ pane in the [web database](https://eppi.ioe.ac.uk/eppi-vis/login/open?webdbid=232)).

The map is a living map (database) that will be regularly updated with new records of eligible articles as they become available, once we have identified and coded them. An updated version of the map will be published once a month, at the start of each calendar month, until the end of [this project](https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3863) in November 2022 – with a final archived version to be published on 1st December 2022.

**The final archived version – Version 6 – was published on 16th December 2022 and contains 878 records.**

During 2022, this map was a living map, continuously maintained using [*OpenAlex Browser*](https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3819) and other machine learning tools in [EPPI-Reviewer Web (ER-Web)](https://eppi.ioe.ac.uk/CMS/Default.aspx?alias=eppi.ioe.ac.uk/cms/er4), linked to the [*OpenAlex* dataset](https://openalex.org/) – an open access dataset and repository comprising >250 million records of research articles from across science, linked together in a large network graph. The map is published using the [EPPI-Visualiser (web database) tool](https://eppi.ioe.ac.uk/EPPI-Vis/Login/Index).

**Suggested citation for the map**

Shemilt I, Hollands GJ, Vigurs C, Stansfield C, Thomas J (2022). *Misinformation in COVID-19: a living map of research evidence*. [Archived final version, December 2022]. London: EPPI Centre, UCL Social Research Institute, University College London.

Follow us on Twitter [@EPPI-Centre](https://twitter.com/eppicentre) and [@covidandsociety](https://twitter.com/covidandsociety)

**Aims of the map**

This evidence map aims to serve stakeholders interested in evidence about COVID-19 misinformation, including policy makers and researchers, by:

* Making published research evidence on COVID-19 misinformation (and closely related phenomena) more easily findable, accessible, and reusable;
* Providing a conceptual overview of the current ‘landscape’ of published research evidence on COVID-19 misinformation (and closely related phenomena); and
* Helping to identify gaps in bodies of research evidence on COVID-19 misinformation (and closely related phenomena) that could potentially be filled by new primary studies or systematic reviews.

We do not claim that the map is comprehensive – that is, it does not include every research article published between 2019-20 and 2022 that would meet its eligibility criteria (see ‘Identifying the evidence’). Our aim was for this map to provide a broadly representative, high-level conceptual overview of the different types of published research studies that are rapidly emerging within this broad topic area.

We also acknowledge the large bodies of research evidence on misinformation (and closely related phenomena) that exist in published studies conducted in contexts and settings beyond the COVID-19 pandemic. Although these indirectly applicable bodies of evidence are beyond the scope of this map, we recognise their potential for contributing to a better understanding of how specific measures can be deployed to tackle misinformation and/or its spread, and/or to mitigate its adverse impacts, in COVID-19 and future viral pandemics/ public health emergencies.

**Identifying the evidence**

Each record included in the map contains bibliographic details of a published article that reports an empirical research study on misinformation (or closely related phenomena) in COVID-19 (including full-text links when available).

***Eligibility criteria for the map***

To be eligible for publication in the map a record (article) needed to meet the following criteria:

* *Empirical research*. Article must report empirical data from either primary research, systematic review[[1]](#footnote-1) or modelling[[2]](#footnote-2) studies.
* *Publication date*. Article must report a study published since 1st December 2019, when the SARS-COV-2 virus was first identified. Articles published before this date are excluded (see also ‘4.’).
* *On topic for misinformation*. Article must report a study with a sole or primary focus on misinformation and/or closely related phenomena. Studies of closely related phenomena – described as 'disinformation', 'malinformation', 'false…'/ 'misleading…'/ 'fake…'/ 'junk…'/ or 'pseudoscientific…' ['…information/ news/ facts' etc.], 'pseudoscience', 'hoaxes', and/or 'propaganda' – are included; while studies of phenomena described as 'unverifiable…' and/or 'rumours', are excluded.
* *On topic for COVID-19*. Article must report a study that has a sole or primary focus on COVID-19. Studies with a primary focus on misinformation (or closely related phenomena) in other contexts (encompassing other viral pandemics/ public health emergencies and/or non-health contexts) are excluded if they do not also include a primary focus on misinformation in COVID-19.
* *Publication language*. Articles published in any language are included.

The following types of articles were excluded from the map:

* Preprints and working papers, including Research Papers in Economics (REPEC), Social Science Research Network (SSRN) and US National Bureau of Economics Research (NBER) Working Papers.
* Opinion pieces, non-systematic reviews, guidance, consensus statements, hypotheses.
* Protocols for primary research or modelling studies which do not report findings data.
* Systematic reviews which do not (plan to) report findings data (mapping reviews; reviews which only contain guideline documents / opinion pieces).
* Methods papers (including validation of data collection methods if usable primary data are not reported).
* Corrections, errata, or retractions.
* Responses or replies which do not report substantive new data or analysis.
* Items in data repositories.

***Identifying the evidence***

Version 1

To identify eligible articles for Version 1 (the inaugural version) of the map, we searched the following sources[[3]](#footnote-3):

* + A preliminary scoping search conducted using a custom search of the Microsoft Academic Graph (MAG) dataset [1, 2] *MAG Browser* tools in EPPI-Reviewer Web (‘ER-Web’) [3] (up to 13th September 2021);
	+ A keyword search of a living map of research on COVID-19 [4] (up to 22nd March 2022);
	+ A keyword search of a living map of systematic reviews of social sciences research on COVID-19 [5] (up to 22nd March 2022);
	+ An updated custom search of the *OpenAlex* dataset [6] (replaced the MAG dataset from 1st January 2022) using *OpenAlex Browser* tools in ER-Web (up to 28th February 2022);
	+ A network graph search of the *OpenAlex* dataset using *OpenAlex Browser* tools in ER-Web (up to 28th February 2022);
	+ An auto-update search of the *OpenAlex* dataset using *OpenAlex Browser* tools in ER-Web (up to 11th March 2022);
	+ An updated network graph search of the *OpenAlex* dataset using *OpenAlex Browser* tools in ER-Web (up to 11th March 2022);
	+ Manual searches of selected organisational websites and other grey literature sources (up to 15th June 2022).

Records retrieved from these sources were managed using ER-Web tools, to semi-automatically: de-duplicate records between and within sources; select records to be retained or discarded based on scoring by pre-built machine learning classifiers; match retained records to their corresponding *OpenAlex* record(s), when available (only applies to a minority of records not originally sourced from the *OpenAlex* dataset), and finally add retained, matched records to a pool of unscreened records for potential screening (see ‘Selecting the evidence’, below).

Version 2 to Version 6

Our *OpenAlex Browser* tools were configured to run updated network graph and auto-update searches of the *OpenAlex* dataset each time a new update of this dataset was released and integrated into ER systems (~ every four weeks), with these searches ‘seeded’ by the accumulating corpus of eligible records already selected for inclusion in the map (see ‘Selecting the evidence’ below). This approach to searching for eligible studies was consistent with the emerging new paradigm of ‘continuous evidence surveillance’ for living evidence synthesis [7-9]. Records retrieved from these recurring, prospective searches of sequential updates of the *OpenAlex* dataset were also managed using ER-Web tools (as described above). ***The latest automatic searches for this map were run on the OpenAlex dataset up to 10th October 2022.***

***Selecting the evidence***

Bibliographic title-abstract records were screened for eligibility for inclusion in the map by one researcher, consulting with (a) corresponding full text articles and (b) other team members as needed, based on applying the eligibility criteria described above. Records were screened using priority screening mode (active learning) in ER-Web [10]. Corresponding full texts (PDF) into ER-Web to facilitate coding (N.B. full texts are not re-published in the open access web database). Records (title-abstract) and corresponding full texts were translated into English from non-English languages using Google Translate, when needed.

**Coding the evidence**

Each record was coded for the map by one researcher, consulting with (a) corresponding full text articles and (b) other team members as needed, using the following coding scheme and explanatory notes:

***Topic(s)***

These codes are manually assigned during the coding stage. Assign all topic code(s) that apply.

* Prevalence / Characteristics

*Scope*: Studies investigating the prevalence/propensity, or basic characteristics or content, of COVID-19 misinformation (or closely related phenomena) or COVID-19 misinformation beliefs (or closely related phenomena).

*Elaboration*: Also includes studies linking prevalence with factors such as countries, host platforms, and demographic categories; and studies describing the content of databases (or similar collections) of COVID-19 misinformation. Can relate to misinformation at a single time-point or trends over time.

* Causes / Mechanisms

*Scope:* Studies investigating the causes, or mechanisms of generation, or transmission of COVID-19 misinformation (or closely related phenomena).

*Elaboration*: Studies of the nature or extent of underlying causes/ mechanisms that may explain COVID-19 misinformation and/or its spread. Includes studies investigating associated individual-level factors or mechanisms, including of a socio-political, psychological, cognitive, emotional, or perceptual nature (e.g. susceptibility to COVID-19 misinformation, propensity to share misinformation, risk perceptions, emotional responses, trust in institutions or science). Also includes studies mapping, modelling or describing in detail the nature of processes or networks by which COVID-19 misinformation spreads; and studies of the mechanisms by which the use of (mis)information by prominent figures, the media etc. can generate or propagate misinformation. Usually this code would be expected to be accompanied by coding of Prevalence/Characteristics.

* Harms / Adverse effects
*Scope*: Studies investigating harmful (or possibly harm-reducing) impacts/ consequences, or adverse effects associated with COVID-19 misinformation exposure or related beliefs (or closely related phenomena).

*Elaboration*: Includes studies of the impacts of COVID-19 misinformation on, e.g. vaccination intent/behaviour, preventive behaviours, or mental health (e.g. anxiety, depression). Includes studies framing this in terms of the presence or absence of such impacts. Usually this code would be expected to be accompanied by coding of Prevalence/Characteristics, and additionally Causes/Mechanisms if it concerns (intermediary) modifiers of the link between misinformation and harms.

* Fully Automated Tool(s)

*Scope*: Studies describing and/or evaluating fully automated (i.e. without humans in the loop) tool(s) for identifying, classifying, or labelling COVID-19 misinformation.

*Elaboration*: Includes a large body of studies from computer sciences (or related disciplines) evaluating the performance of machine learning algorithms, artificial intelligence and related technologies for automatically identifying, classifying, or labelling COVID-19 misinformation in datasets assembled from online media content, e.g. tweets, news articles, images etc. Where the focus is not solely/predominantly on describing or evaluating the development or performance of the tool, this code could be expected to be accompanied by other codes e.g. Prevalence/Characteristics, where the tool is used to gather a dataset on misinformation, the content of which is then subsequently described.

* Description of interventions / policies

*Scope*: Specifically excludes studies of fully automated tools. Includes studies that describe any other type(s) of interventions, policies, practices or other measures designed to highlight, correct, reduce, or prevent COVID-19 misinformation (or closely related phenomena) or its spread.

*Elaboration*: Includes studies that describe an intervention or other measure for tackling COVID-19 misinformation that involves humans in at least some aspect of its delivery. This would include any studies describing: any type of organisational response to COVID-19 misinformation (e.g. fact checking); informal practices or responses used by (groups of) people to counter COVID-19 misinformation; interventions for promoting media, digital and/or health literacy; interventions for promoting trust in government/ science/ public institutions; interventions for promoting social capital interventions drawing on insights from behavioural science to target cognitive processes; or studies of legislative policies to sanction 'bad actors'. In all cases, the intervention or measure must have been explicitly designed to tackle misinformation in COVID-19 (see ‘Eligibility criteria for the map’). Unless clearly relating to a separate or distinct empirical process, any insights into Prevalence/Characteristics, Causes/Mechanisms or Harms/Adverse effects are not coded in conjunction when the focus is on interventions/policies.

* Evaluation of interventions / policies

 *Scope*: Specifically excludes studies of fully automated tools. Includes studies investigating the efficacy, effectiveness, quality, experience, or other relevant dimension of any other type(s) of interventions, policies, practices or other measures designed to highlight, correct, reduce, or prevent COVID-19 misinformation (or closely related phenomena) or its spread.

*Elaboration*: Includes studies that evaluate any intervention or other measure for tackling COVID-19 misinformation that involves humans in at least some aspect of its delivery. This would include any studies describing: any type of organisational response to COVID-19 misinformation (e.g. fact checking); informal practices or responses used by (groups of) people to counter COVID-19 misinformation; interventions for promoting media, digital and/or health literacy; interventions for promoting trust in government/ science/ public institutions; interventions for promoting social capital; interventions drawing on insights from behavioural science to target cognitive processes; studies of legislative policies to sanction 'bad actors'. In all cases, the intervention or measure must have been explicitly designed to tackle misinformation in COVID-19 (see ‘Eligibility criteria for the map’). To be assigned to this code, the article must include a methods section or equivalent detail about the evaluation approach (this criterion is necessary but not sufficient). Evaluation studies invariably also describe the intervention or measure being evaluated to some extent (and are therefore invariably also assigned to the preceding topic code). Unless a clearly relating to a separate or distinct empirical process, any insights into Prevalence/Characteristics, Causes/Mechanisms or Harms/Adverse effects are not coded in conjunction when the focus is on interventions/policies.

***Version(s)***

These codes are manually assigned during the post-production stage. Assign all topic code(s) that apply.

* All Versions
* Version 1 - 1st July 2022
* Version 2 - 2nd August 2022
* Version 3 - 1st September 2022
* Version 4 - 3rd October 2022
* Version 5 - 1st November 2022
* Version 6 - 16th December 2022

***Research Type(s)***

This code is manually assigned during the eligibility screening stage. Assign one code:

* Primary research
* Systematic review
* Modelling

***Misinformation Term(s)***

This code is manually assigned during the coding stage. Assign all those terms used in the article title-abstract (only) to describe misinformation and/or closely related phenomena.

* Misinformation
* Disinformation
* Malinformation
* False
* Misleading
* Fake
* Junk
* Pseudoscience
* Conspiracy theory
* Hoax
* Propaganda

**Results**
***Current version (Archived final version)***

Version 6 (current version *and* archived final version) of this living evidence map was published on 16th December 2022. Between Version 5 (1st November 2022) and Version 6 (16th December 2022), we screened a further 91 records identified from the *OpenAlex* dataset (up to 10th October 2022) and other sources (see 'Identifying the evidence'). 40 of these records were excluded, 2 records were duplicates (also excluded), and 49 further records of eligible articles were identified and assigned for coding, making a total of 60 records awaiting further assessment and/or completion of coding. On 16th December 2022, 49 of the latter records had been fully coded, added to the map and published in Version 6, while the other 11 eligible articles were still awaiting further assessment and/or completion of coding. Version 6 of the map therefore includes a final total of 878 fully coded records of eligible articles.

***Previous versions***

Version 5 of this living evidence map was published on 1st November 2022. Between Version 4 (3rd October 2022) and Version 5 (1st November 2022), we screened a further 270 records identified from the *OpenAlex* dataset (up to 31st August 2022) and other sources (see 'Identifying the evidence'). 193 of these records were excluded, 2 records were duplicates (also excluded), and 75 further records of eligible articles were identified and assigned for coding, making a total of 226 records awaiting further assessment and/or completion of coding. On 1st November 2022, 215 of the latter records had been fully coded, added to the map and published in Version 5, while the other 11 eligible articles were still awaiting further assessment and/or completion of coding. Version 5 of the map therefore included a cumulative total of 829 fully coded records of eligible articles.

Version 4 of this living evidence map was published on 3rd October 2022. Between Version 3 (1st September 2022) and Version 3 (3rd October 2022), we screened a further 177 records identified from the *OpenAlex* dataset (up to 31st August 2022) and other sources (see 'Identifying the evidence'). 32 of these records were excluded, 2 records were duplicates (also excluded), and 143 further records of eligible articles were identified and assigned for coding, making a total of 279 records awaiting further assessment and/or completion of coding. On 3rd October 2022, 128 of the latter records had been fully coded, added to the map and published in Version 4, while the other 151 eligible articles were still awaiting further assessment and/or completion of coding. Version 4 of the map therefore included a cumulative total of 614 fully coded records of eligible articles.

Version 3 of this living evidence map was published on 1st September 2022. Between Version 2 (2nd August 2022) and Version 3 (1st September 2022), we screened a further 119 records identified from the *OpenAlex* dataset (up to 1st May 2022) and other sources (see 'Identifying the evidence'). 58 of these records were excluded, 2 records were duplicates (also excluded), and 59 further records of eligible articles were identified and assigned for coding, making a total of 200 records awaiting further assessment and/or completion of coding. On 1st September 2022, 64 of the latter records had been fully coded, added to the map and published in Version 3, while the other 136 eligible articles were still awaiting further assessment and/or completion of coding. Version 3 of the map therefore included a cumulative total of 486 fully coded records of eligible articles.

Version 2 of this living evidence map was published on 2nd August 2022. Between Version 1 (1st July 2022) and Version 2 (2nd August 2022), we screened a further 83 records identified from the *OpenAlex* dataset (up to 11th March 2022) and other sources (see 'Identifying the evidence'). 42 of these records were excluded, 1 record was a duplicate (also excluded), and 40 further records of eligible articles were identified and assigned for coding, making a total of 289 records awaiting further assessment and/or completion of coding. On 2nd August 2022, 148 of the latter records had been fully coded, added to the map and published in Version 2, while the other 141 eligible articles were awaiting further assessment and/or completion of coding. Version 2 of the map therefore included a cumulative total of 422 fully coded records of eligible articles.

For Version 1 of this living evidence map (published on 1st July 2022), we screened 876 records identified from the *OpenAlex* dataset (up to 11th March 2022) and other sources (see 'Identifying the evidence'). 345 records of these records had been excluded, 8 records were duplicates (also excluded), and 523 records of eligible articles had been identified. On 1st July 2022, 274 of these articles had been fully coded, added to the map and published in Version 1, while the other 249 eligible articles were awaiting further assessment and/or completion of coding.

**Funding**

This map was produced by the [EPPI Centre](https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=53) as a partner of the [International Public Policy Observatory (IPPO)](https://covidandsociety.com/), funded by the [UK Economic and Social Research Council](https://www.ukri.org/councils/esrc/) (ESRC).

**Conflicts of interest**

We are also members of the [EPPI Centre](https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=53) team that develops [*EPPI-Reviewer*](https://eppi.ioe.ac.uk/CMS/Default.aspx?alias=eppi.ioe.ac.uk/cms/er4) software for evidence synthesis, including its [*OpenAlex Browser*](https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3819)*,* [machine learning](https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3772) and [*EPPI-Visualiser*](https://eppi.ioe.ac.uk/EPPI-Vis/Login/Index) tools, which are all deployed in the semi-automated workflows we used to produce and publish this map. We have no other conflicts of interest.

**References**

[1] Sinha A, Shen Z, Song S, Ma H, Eide D, Hsu B-J, Wang K. [An Overview of Microsoft Academic Service (MA) and Applications](https://explore.openalex.org/works/W1932742904). In *Proceedings of the 24th International Conference on World Wide Web* (WWW 15 Companion): 243-246. ACM, New York, NY, USA. 2015.

[2] Wang K, Shen Z, Huang C, Wu C-H, Eide D, Dong Y, Qian J, Kanakia A, Chen Al, Rogahn R. [Review of Microsoft Academic Services for Science of Science Studies](https://explore.openalex.org/works/W2993670251). *Frontiers in Big Data* 2019; 2: 45.

[3] Thomas J, Graziosi S, Brunton J, Ghouze Z, O Driscoll P, Bond M (2021). [*EPPI-Reviewer: advanced software for systematic reviews, maps and other evidence synthesis*](https://eppi.ioe.ac.uk/CMS/Default.aspx?alias=eppi.ioe.ac.uk/cms/er4) [Software].

[4] Lorenc T, Khouja C, Raine G, Shemilt I, Sutcliffe K, D Souza P, Burchett H, Hinds K, Macdowall W, Melton H, Richardson M, South E, Stansfield C, Thomas S, Kwan I, Wright K, Sowden A, Thomas J (2020). [*COVID-19: living map of the evidence*](http://eppi.ioe.ac.uk/cms/Projects/DepartmentofHealthandSocialCare/Publishedreviews/COVID-19Livingsystematicmapoftheevidence/tabid/3765/Default.aspx). London: EPPI-Centre, Social Science Research Unit, UCL Institute of Education, University College London.

[5] Shemilt I, Gough D, Thomas J, Stansfield C, Bangpan M, Brunton J, Dickson K, Graziosi S, Hull P, Kneale D, Larsson C, Mendizabal-Espinosa R, Muraki S, Ramadani F, Vigurs C (2022). [*Living map of systematic reviews of social sciences research evidence on COVID-19*](https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3806). London: EPPI Centre, UCL Social Research Institute, University College London.

[6] Chawla DS. [Massive open index of scholarly papers launches](https://explore.openalex.org/works/W4207002271) [News]. *Nature* 2022, 24th January.

[7] Shemilt I, Arno A, Thomas J, Lorenc T, Khouja C, Raine G, Sutcliffe S, D'Souza P, Kwan I, Wright K, Sowden A. [Cost-effectiveness of Microsoft Academic Graph with machine learning for automated study identification in a living map of coronavirus disease 2019 (COVID-19) research](https://explore.openalex.org/works/W3193696667). *Wellcome Open Research* 2021 6:210.

[8] Elliott JH, Synnot A, Turner T, Simmonds M, Akl EA, McDonald S, Salanti G, Meerpohl J, MacLehose H, Hilton J, Tovey D, Shemilt I, Thomas J. [Living systematic review: 1. Introduction-the why, what, when, and how](https://explore.openalex.org/works/W2754736027). *Journal of Clinical Epidemiology* 2017; 91: 29-30.

[9] Thomas J, Noel-Storr A, Marshall I, Wallace B, McDonald S, Mavergames C, Glasziou P, Shemilt I, Synnot A, Turner T, Elliott J. [Living systematic reviews: 2. Combining human and machine effort](https://explore.openalex.org/works/W2755149525). *Journal of Clinical Epidemiology* 2017; 91: 31-37.

[10] O Mara-Eves A, Thomas J, McNaught J, Miwa M, Ananiadou S. [Using text mining for study identification in systematic reviews: a systematic review of current approaches](https://explore.openalex.org/works/W2147469877). *Systematic Reviews* 2015; 4: 5.

**Copyright**

Authors of the systematic reviews published on the [EPPI Centre website](http://eppi.ioe.ac.uk/) hold the copyright for the text of their reviews. The EPPI Centre owns the copyright for all material on the website it has developed, including the contents of the databases, manuals, and keywording and data-extraction systems. The centre and authors give permission for users of the site to display and print the contents of the site for their own non-commercial use, providing that the materials are not modified, copyright and other proprietary notices contained in the materials are retained, and the source of the material is cited clearly following the citation details provided. Otherwise, users are not permitted to duplicate, reproduce, re-publish, distribute, or store material from this website without express written permission.

1. Eligible systematic review articles report at least: some search terms; clearly defined inclusion criteria; and some information on the selection process (at least N of references located by searches and N of studies included). Rapid reviews meeting these (and other) eligibility criteria are also included. We include any systematic review which aimed to include studies on COVID-19 misinformation, whether any were located or not. We include updates to systematic reviews and living reviews if the report presents new data and the original review meets the criteria above. We will also include protocols for systematic reviews that are ‘on topic’ and report: at least some search terms; and clearly defined inclusion criteria. We will also include novel meta-analyses of data from eligible primary studies that are not underpinned by systematic reviews (as defined). [↑](#footnote-ref-1)
2. We include articles reporting modelling studies that are at least partly based on empirical data related to COVID-19 misinformation (e.g. data used as inputs to the model, or data against which the model is being calibrated or tested). We exclude purely theoretical modelling studies. [↑](#footnote-ref-2)
3. Further details of search strategies (including search terms, methods, tools and procedures) are available from the authors on request. [↑](#footnote-ref-3)